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ABSTRACT

The Dahlem Environmental Education Center (Jackson, Michigan) has developed 14 environmental education field trip programs for students in preschool through fifth grades. These sequential, grade-specific programs help make the environment relevant to students by addressing human impact in the natural world and ecological principles at work in urban environments. The latter is accomplished primarily through teacher packets of pre- and post-trip activity ideas and information. Although the program addresses the science curriculum at each grade level, the interdisciplinary nature of the program allows for the enhancement of other subject areas. These features encourage teachers to bring groups to the Center year after year and to extend the program to their classroom with the pre- and post-trip activities. A scope and sequence chart illustrating the cognitive, affective, and skills objectives for the 14 units and a table listing the science objectives and sample bridging concepts for the various grade levels are included. Results obtained from pre- and post-tests administered to students in nine classrooms participating in two different programs indicate that the experimental groups' understanding of ecological concepts and environmental facts was statistically greater than that of control groups. (JN)

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BRIDGING THE GAP BETWEEN THE NATURAL AND THE BUILT ENVIRONMENTS WITH NATURE CENTER PROGRAMS

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Across the country nature centers play a vital role in protecting and interpreting the natural world to thousands of visitors. Through excursions to frog ponds, climax forests, or intriguing canyons, many Americans experience their outdoor environment and come to appreciate the complex world of nature.

These ventures to nature centers are important to help people understand the ecological principles that govern life on our planet. But to understand principles such as food chains and the water cycle only as they are exhibited in the natural world is not enough. Naturalists and nature centers need to do much more. They need to bridge the gap to the built environment.

Almost 75% of the American population is crowded onto 16% of our land surface (Ann Arbor News, 1981), making the majority of nature center visitors from urban areas. To most, the ecological foundations of the natural world are interesting, but may have little transferability to the learners' nome environment if this connection is not planned. It is not easy to bridge the gap from food chains to grocery stores, deer trails to freeways, or rotten logs to landfills, yet the urban population must understand the ecology of their environment if they are to make wise decisions about natural resources and environmental quality. With only a few modifications in program content, many nature centers can help visitors to make these connections from the natural to the built environment (Tzitz, 1980).

Keeping this goal in mind, the Dahlem Environmental Education Center of Jackson, Michigan began developing a series of school field trip programs. With assistance from the Institute of Museum Services of the U.S. Department of Education, fourteen environmental education programs from preschool to fifth grade were developed. Each program helps make the environment relevant to the students by addressing human impact in the natural world and ecological principles at work in urban environments. The latter is accomplished primarily through teacher packets of pre-trip and post-trip activity ideas and information. Both the teacher packets and field trip outlines are available for a small fee to interested organizations and educators.

In addition to the program ideas, naturalists may be interested in the program development process, the program objectives, and the teacher packet design.

Before the development process began, several constraints to

SE045109

ideal program use were identified: 1) field trips can only last 1-3 hours, 2) few teachers build upon the field trip concepts in school, and 3) administrators favor repeat trips to a center only if they know the students are learning new material. All of these constraints were mitigated by designing sequential, grade-specific programs that address the science curriculum at each grade level. The interdisciplinary nature of the program allows for the enhancement of other subjects, but tying the program to the science curriculum encourages teachers to make the field trip and to extend the program to their classroom.

Program Development

Elementary science objectives in public schools from New Jersey to Hawaii were obtained from the Educational Resources Information Center (ERIC). Table 1 shows the common denominators in science from kindergarten through fifth grade and examples of concepts the Dahlem Center used to bridge the gap between the natural and the built environments. By meshing these concepts with topics relevant to the Jackson area, fourteen program options were selected. An umbrella of project goals and objectives in the cognitive, affective, and skill domains followed (see Table 2).

Teacher committees at various grade levels proved invaluable for evaluating and targeting the objectives of the programs. These teachers also critiqued drafts of the packets and tested new ideas and activities. A variety of other resources contributed to the curriculum -- elementary science textbooks, environmental education activity guides, interpretive field guides, county media centers, and professional environmental educators.

Examples

The critical difference between the Dahlem Center's programs and every other environmental education curriculum is the attempt to introduce ecological concepts in the built environment, develop them in the natural world, and apply these concepts in the students' home environment. Several strategies were employed to achieve this bridge.

In the first grade program, "Spring Birds," students participate in fairly typical birding activities at the Dahlem Center -- using binoculars, listening to bird calls, looking for field marks, and comparing beaks and foods. The teacher packets includes activities to introduce and reinforce these concepts, with an emphasis on local, urban birds. Students have the opportunity to observe birds in their neighborhood, make bird models, build bird feeders, and gain in cooperative skills and responsibility. In this case the topic is the main theme: students study birds in the natural and built environments. Concepts such as habitat management and adaptations play a supporting role.

At older grade levels it is much easier to make the connection

with concepts and issues like decomposition and the water cycle. Like other centers, the Dahlem Center has a program that includes exploring ponds for aquatic organisms. "Our World of Water," however, also emphasizes the water cycle and the management issues involved with this critical resource. The quantity of water used by each student in one week and where their wastewater goes plays as major a role in this program as the pond food web. Faucets and toilets may be more meaningful to urban learners than wetlands! By taking a closer look at both the built and the natural environments within the context of ecological principles, students begin to see their world as one interconnected system.

Evaluation

A wide variety of evaluative techniques were used throughout this project. Formative evaluations from the teacher committees and consulting educators allowed for revisions in the packets and field trip programs. Although their comments have improved our programs immensely, formative evaluations are exceedingly time consuming and are part of the reason we have not yet printed all the packets.

Two forms of summative evaluations -- a teacher questionnaire and student pre- and post-tests -- were implemented in 1982. Teacher responses were positive and encouraging. Although the student tests were pilots, they yielded significant, positive results. We hope to complete a more carefully designed evaluation this spring that will better address transferability and growth in the affective domain.

Nine classrooms participated in the testing in two different programs. All students received pre-tests and post-tests that were parallel, but not identical. The control classes did not receive a teacher packet or field trip; the experimental classes received both.

In both programs, the experimental groups' scores improved significantly, and this increase was statistically greater than that of the control groups ($p < .05$). These results indicate that the experimental groups' understanding of ecological concepts and environmental facts was due to the Dahlem Center's program and not to chance. (Statistics evaluated by Dr. Michael Walraven, Jackson Community College.) That the control groups also improved is a common pre-testing phenomenon -- some learning results from arousing student's interest in an unfamiliar topic. Interestingly enough, the experimental groups' pre-test score was higher that the control groups' pre-test score. This may be due to the non-random selection of classrooms; experimental classes were chosen from teachers who bring their classes to the Dahlem Center. They may teach more environmental concepts and awareness throughout the year than the non-participating teachers who were selected for the control classrooms.

Summary

The school programs at the Dahlem Environmental Education Center represent a first step toward helping urban learners make sense of their world by drawing strong connections between the natural and the built environments. In addition, the series is sequential, grade-specific, and supplements the science objectives in elementary schools. These features encourage teachers to bring groups to the Dahlem Center year after year and to extend the program to their classroom with pre-trip and post-trip activities, which strengthen the transferability of ecological concepts.

Individual field trip outlines and completed teacher packets are available for 25¢ and $1.00, respectively. They can be ordered by writing the Dahlem Environmental Education Center, 7117 South Jackson Road, Jackson, Michigan 49201, or by calling (517) 787-0806, ext 197. Although the materials are copyrighted, permission to reprint them will happily be granted upon request.

Literature Cited

The Ann Arbor News. "Suburbia." November 25, 1981. pg. 1.

Tzitz, Carolyn Joy. Ways of Making Nature Centers More Relevant for Their Urban Visitors. University of Michigan master's practicum, 1980.

COMMON SCIENCE OBJECTIVES AND BRIDGING CONCEPTS		
Grade	Science Objectives	Sample Bridging Concepts
Kinder-garten	Observe with senses -- comparing Living and non-living things -- diversity Plant and animal life requirements	Sensing the built and natural environments Seasonal changes Needs of all living thirgs
First Grade	Classifying -- organizing Living and non-living things Reproduction and growth Life cycles and change Plant and animal life requirements Daily and seasonal weather changes	Discovering birds and insects in the built and natural environment -- their needs, life cycles, adaptations, diversity, and habits
Second Grade	Life cycles Habitat diversity Plant structures and their function	Amphibian life cycles Food chains in the built and natural environments Plant structures Seeds in the built and natural environments
Third Grade	Changes in habitat -- succession Habitats and organisms -- communities Food chain and web -- interdependence Population growth and change Adaptations Sun energy and green plants	Forest ecology Decompositon in the built and natural environments Population dynamics in the built and natural environments Food webs in the built and natural environments
Fourth Grade	Organism responses to environmental changes Pollution and conservation Population interaction Food web Interdependence Erosion and weathering Water cycle	Energy in the built and natural environments Interdependence and change in the built and natural environments Decision making Human impact on the natural environment
Fifth Grade	Food chain and nutrient cycles Photosynthesis and decomposition Community and population change Geological changes Adaptations Interdependence	Water quality and water cycle in the built and natural environment Geology in the natural and built environment Natural and human-caused change in the natural and built environments Interdependence in the natural and built environments Problem solving

Table 1

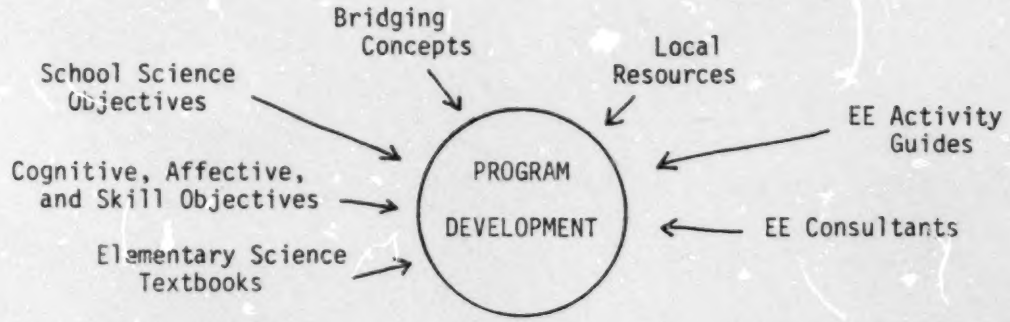
Table 2
Scope and Sequence Chart

		COGNITIVE							AFFECTIVE			SKILLS				
		Energy	Cycles	Diversity	Community	Interdependence	Change	Adaptations	Awareness	Feelings	Valuing	Observing	Classifying	Cooperating	Communicating	Problem-Solving
Signs of Fall	P				•		•		•			•	•	•	•	
Signs of Spring	P				•		•		•			•	•	•	•	
Nature Prepares for Winter	K		•			•	•	•	•			•	•	•	•	
Who Lives There?	K		•	•	•	•			•			•	•	•	•	
Interesting Insects	1	•		•		•	•		•			•	•	•	•	•
Spring Birds	1	•		•	•	•		•	•	•		•	•	•	•	•
Nature's Hitchhikers	2		•			•	•	•	•	•		•	•	•	•	•
Frogs and Toads	2	•				•	•	•	•	•		•	•	•	•	•
Animal Homes and Habits	3	•		•	•	•	•		•	•	•	•	•	•	•	•
Forest and Flowers	3	•	•	•	•	•			•	•	•	•	•	•	•	•
Energy in the Air	4	•				•	•		•	•	•	•	•	•	•	•
Michigan's Natural History	4			•	•	•	•	•	•	•	•	•	•	•	•	•
Reading the Rocks	5					•	•	•	•	•	•	•	•	•	•	•
Our World of Water	5	•	•		•	•	•	•	•	•	•	•		•	•	•

PROGRAM DEVELOPMENT

I. Needs Assessment

II. Program Philosophy



III. Development Process

A. Select program topics
B. Identify overall program topics
C. Compile scope and sequence chart
D. Identify program goals and objectives
E. Form grade-specific teacher committees
F. Research EE and science activities, design new ones
G. Design teacher packet
H. Develop trail outline and teacher packets
I. Formative evaluation
J. Revise teacher packets and print
K. Train volunteer and intern field guides

IV. Program Implementation

V. Evaluation

A. Informal evaluations -- revise trail outlines
B. Formal, summative evaluations -- revise teacher packets (future)

VI. Disseminate materials and results